MORE ON THE MOONBOUNCE UNIVERSAL WINDOW FOR 144 MHz

DIVISION OF VARIAN
301 Industrial Way
San Carlos, California

AS-49-3

PROPOSAL FOR A UNIVERSAL EME MOONBOUNCE WINDOW

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In much the same way that "calling frequencies" are useful in promoting activity on some VHF propagation modes, a "universal window" could be of great value in promoting EME (earth-moon-earth) activity. The phrase "universal window" is used here to mean a selected area of the sky which the community of EME enthusiasts agree to use as a primary target for aiming their antenna arrays. First let us explore what could result from such an agreement by EME operators and then let us consider which particular area of the sky should be selected.

For EME to be enjoyed by the greatest number of interested operators, those stations with the facilities for erecting vast, high-gain, arrays should be encouraged to build the largest possible antennas. These stations could then furnish EME contacts to stations with much smaller arrays. Unfortunately, at the present time anyone who builds a large fixed, or partially steerable, EME array might find that his window is not shared by many other EME stations. With such a limited prospect of success, only the most courageous among us have invested their time and money in massive EME antenna construction projects. On the other hand, the existence of a universal window would give confidence to stations building large fixed arrays that their efforts would be rewarded by access to all other EME stations. Another advantage of a universal window is the simplification of moon tracking problems; in fact, any practical antenna could be oriented in a fixed position within the window and yield several moon-days per month.

Now let us consider which point in the sky should be chosen for the universal window. The window which is now used for European EME schedules (see AS-49-2) has been suggested by Bob Sutherland, W6PO, as a window which offers several advantages over other choices:

1. It is now being used for regular schedules by several stations which implies that anyone who constructs an antenna aimed at this window can expect some measure of success almost immediately.

2. The window corresponds to a meridian crossing near the middle of the North American continent. This means that all stations in the continental United States would have high antenna elevations when aiming at the window. High elevation angles ease the problem caused by ground-level obstructions (trees, hills, etc.), reduce interference from local stations, minimize TVI, and enable antennas to be mounted near ground level to keep feedline losses low.

3. The window includes the region of maximum northerly lunar declination. Since the moon changes declination in sinusoidal fashion it remains near its maximum declination for several days; thus this window optimizes the number of moon-days per month available to fixed position antennas.

4. The window is designed such that even very high gain antennas need only azimuth steering to further extend the number of available moon-days.

5. Stations on all continents except Asia and Australia can access this window (no single window is accessible from all continents).

Obviously, no window could be truly universal and meet everyone's needs. Therefore, it is proposed only that this window be a primary target; that is, every EME station should insure that his array can be aimed at this window in addition to any other window he might desire to use. If the concept of a universal window is accepted by a majority of EME stations it should not be too long before those fortunate stations with massive arrays have the WAS award within their grasp, while VHF city dwellers with small antennas will be able to enjoy the thrill of communication via the moon.

Explanation of Figures

Figure 1 is a diagram of the proposed universal window in declination and Greenwich hour angle coordinates. The moon is within this window approximately one hour per day for about five days per month. Also shown in this figure are AZ-EL coordinates which bound the window for three geographic locations across the United States.

Figure 2 is diagramed similar to Figure 1. Shown in this figure are the 3 dB beamwidths of two antennas which are fixed in position and aimed at the midpoint of the window. One antenna is a 320-element collinear, and the other is a single 24-element Yagi.

Figure 3 provides AZ-EL coordinates of the midpoint of the window as a function of station location. This data may be interpolated with good accuracy.

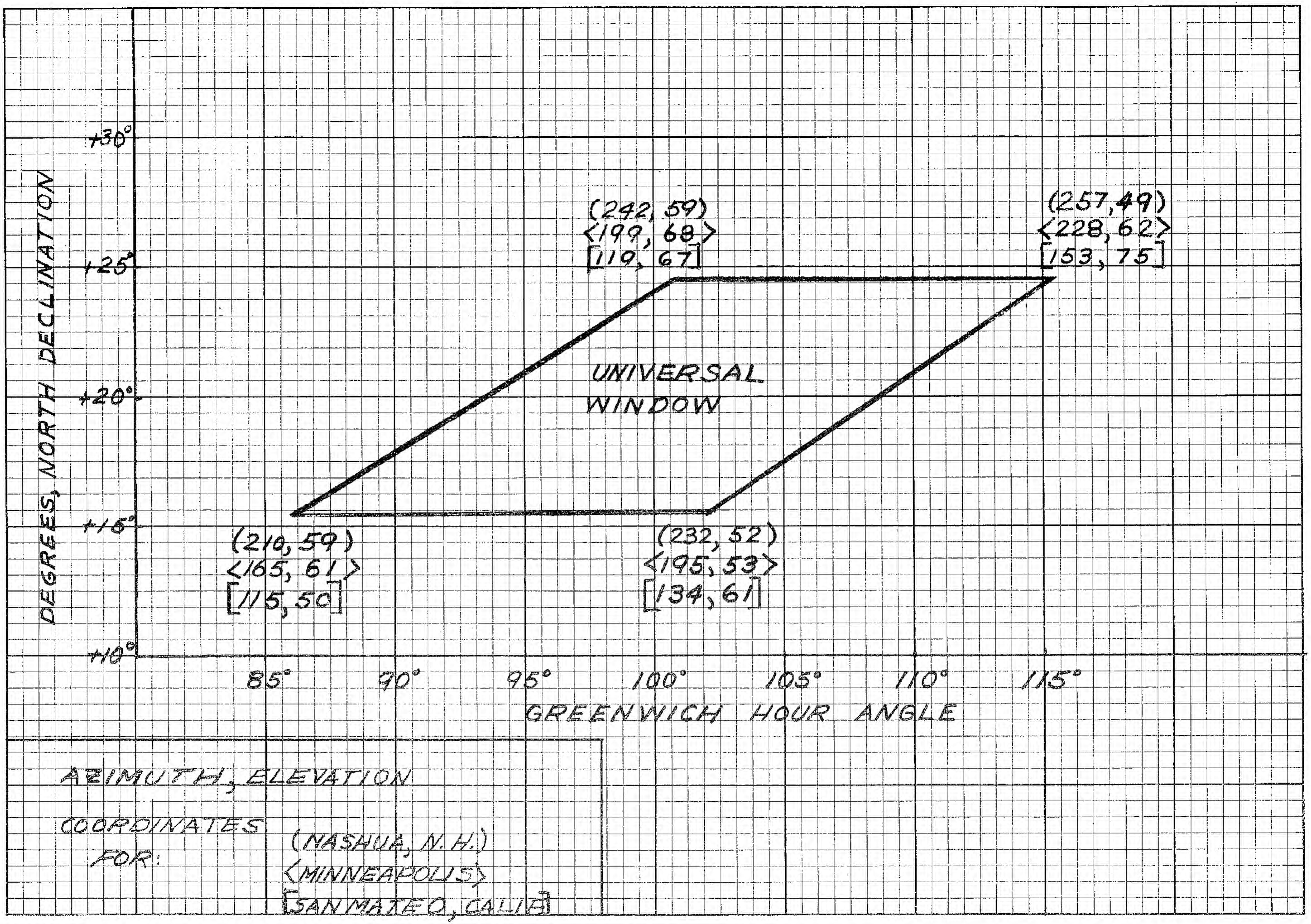

FIGURE 1

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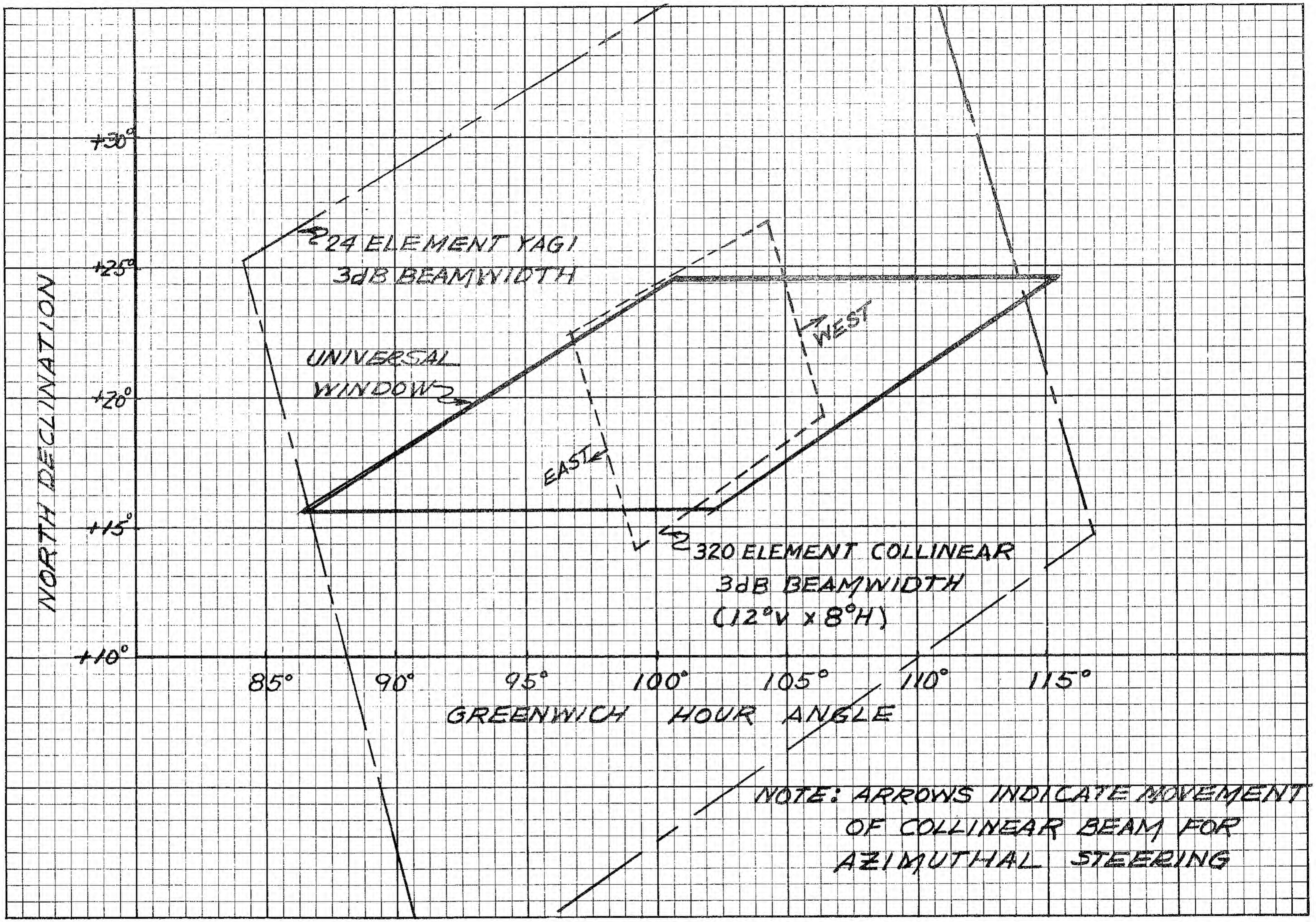

FIGURE 2

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ELEVATION-AZIMUTH COORDINATES VS LOCATION
FOR MIDPOINT OF UNIVERSAL WINDOW
(GHA = 102^o, DEC = 20^oN)

NORTH LATITUDE / WEST LONGITUDE	25^o		30^o		35^o		40^o		45^o	
	El	Az	El	Az	El	Az	El	Az	El	Az
70^o	60.1	266.9	59.4	258.4	58.1	250.4	56.1	243.3	53.6	237.1
75^o	64.6	264.1	63.7	254.0	61.9	244.9	59.5	237.1	56.5	230.6
80^o	69.1	260.6	67.8	248.4	65.5	238.0	62.5	229.7	59.1	223.2
85^o	73.5	255.7	71.7	240.9	68.8	229.4	65.3	221.0	61.3	214.9
90^o	77.8	248.1	75.2	230.1	71.6	218.3	67.5	210.7	63.1	205.6
95^o	81.8	233.7	78.2	213.9	73.8	204.2	69.1	198.7	64.3	195.3
100^o	84.7	200.7	79.8	190.7	74.9	187.2	69.9	185.5	64.9	184.4
105^o	84.3	150.4	79.6	164.1	74.8	169.2	69.8	171.8	64.9	173.3
110^o	81.1	122.5	77.7	142.3	73.4	152.7	68.9	158.7	64.1	162.6
115^o	77.0	110.0	74.6	127.4	71.1	139.2	67.1	147.1	62.8	152.5
120^o	72.7	103.1	70.9	117.4	68.2	128.7	64.7	137.1	60.9	143.3
125^o	68.2	98.6	66.9	110.4	64.8	120.5	61.9	128.7	58.6	135.2

FIG. 3